

# COST *and* MANAGEMENT

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COST ACCOUNTANTS & INDUSTRIAL ENGINEERS

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at 25 cents each.

## Society's Sixth Chapter Organized in Vancouver

**A** NEW Chapter of the Canadian Society of Cost Accountants and Industrial Engineers has been organized in Vancouver, to serve members in Vancouver, Victoria, New Westminster and other convenient points in British Columbia. This is the Society's sixth Chapter, and as Vancouver ranks next in manufacturing importance to the five other sections in which the Society already had Chapters, it is the logical place for this step.

The response in Vancouver has been excellent, and the officers and members of the new Chapter are confident that the Society can be of real benefit to industry there.

The initial meeting, arranged by the Society, was held in the Hotel Vancouver on September 9, the attendance being 44. Harold D. Campbell, C.A., Vancouver, was appointed chairman of the meeting, and T. J. Corley, Vancouver, secretary. W. A. McKague, general secretary of the Society, explained its scope and operations, and outlined the services to members. Following a general discussion, it was decided to hold a further meeting on September 12th, and the following committee was appointed to make a report: Harold D. Campbell, C.A., Vancouver; T. J. Corley, City Hall, Vancouver; H. V. Cox, Canadian Westinghouse Co., Ltd., Vancouver; J. C. Dull, Gregory Tire & Rubber Co., Ltd., Port Coquitlam; W. Griffiths, C.A., New Westminster; R. V. Kirkby, Fraser Valley Milk Producers' Association, Vancouver; J. J. Plommer, C.A., Vancouver.

At the meeting on the 12th, Harold D. Campbell, Chairman, reported that the committee had met with Mr. McKague meanwhile, and were unanimous in favoring the establishment of a Vancouver Chapter. A resolution to this effect was passed, and election of officers resulted in the members of the committee being appointed directors, with the addition of John Harvey, C.A., of Peat, Marwick, Mitchell & Co., and R. T. Robertson, of Remington Typewriters, Ltd. This committee then elected Mr. Campbell as chairman of the Chapter, and Mr. Kirkby as its secretary-treasurer.

The Society already had a number of members in Vancouver and Victoria, which, with applications submitted at the meetings and later, gives Vancouver Chapter a good start with fifteen members.

The directors of the Chapter are now preparing a programme of meetings for this season, and they hope to have both local and outside speakers on cost accounting and related subjects, with time for general discussion as well. The regular meetings of the Chapter will be held on the second Tuesday in each month.

The following statistics of manufacturing output, in the centres where the Society has Chapters, will be of interest. The figures are for 1928, which are the latest available:

## SOCIETY'S SIXTH CHAPTER ORGANIZED IN VANCOUVER

	Number of Plants	Gross Value of Products
Montreal .....	1,834	\$554,311,571
Toronto .....	2,221	565,444,323
Hamilton .....	426	166,262,355
Winnipeg .....	491	105,456,065
Central Ontario (Kitchener, Galt, Guelph, Stratford, Waterloo, Preston, Hespeler) .....	452	116,913,406
Vancouver .....	620	94,131,608

Important municipalities adjoining Montreal and other cities are not included in the above figures. In the case of Vancouver, these would bring the manufacturing output up to well over \$100,000,000, and the addition of St. Boniface would make the Winnipeg figure over \$130,000,000.

## The Industrial Engineer

By H. F. WILSON,  
*Wilson & Fessenden, Kitchener.*

(Before a joint meeting of Toronto, Hamilton, and Central Ontario Chapters, in Toronto, October 1, 1930.)

THE recent decision of your executive to modify the title of the Canadian Society of Cost Accountants to include those whose work is so closely allied to that of the accountant, namely, the industrial engineer, is, I can assure you, a gesture which men in my profession appreciate, and is just one more indication of the growing interest in engineering as applied to industry.

I am very glad indeed to have this opportunity to speak to you for a few minutes on industrial engineering and its relation to business and business men and to endeavour to dissipate some of the fallacies which have grown up around this sometimes misunderstood functional engineering service.

The other day I read the following paragraph:

"But change is the immutable law. The innovations of one age becomes the familiar practices of the next. Revision, remodelling, progress everywhere! The inexorable pressure of the new, the fresh, the original! We may defy, we may protest, yet the world does not move and the directing force of human activity is forward."

The increase of scientific knowledge in the last few decades starting within the material realm has, of course, been the basis of our modern search for causes, laws, and the forecasting of results in place of the somewhat hit and miss industrial practices of years ago.

### Seek Definite Knowledge

On every hand we are surrounded by this slow and groping process of the building up of factual information to enable us to guide our actions to a definitely known result. Consider the very definite

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knowledge of the physical reactions of chemical elements to-day as contrasted with the groping darkness of the alchemist and the early pioneers in the chemical, electrical and other fields. Just so, men are to-day pioneering in the realm of industry, seeking causes, researching methods and processes, establishing formulae which will produce known results and in general building up factual control in business.

To-day the world has turned from the war of guns to the equally rigorous contest of industry. Countries, entrenched and fortified by tariff, are finding that even within their own borders, the constant and rapid improvements in machinery and methods are setting up a pace which every unit in an industry must maintain or drop out. In Europe, says Mr. Wallace Clark, a very eminent cosmopolitan industrial engineer, in an address before the Taylor Society in New York:

"There is one thing which these foreign clients have in common. That is the realization that conditions have been changing and that organizations, plants, and methods must also change.

"These are all prosperous firms, and most of them are among the foremost in their respective countries. The shop executives are open-minded and eager to secure the benefits of the new methods of management through better quality, increased quantity, and reduced cost of production, and, above all, through an improved turnover of investment. These Companies are equal to the average in this country as to buildings and equipment.

"A vast amount of research and development work in progress in these countries is taking form in new products and new types of construction from which we can learn much.

"Before the war, scientific management dealt principally with problems and conditions which remained fairly constant in any given plant. Now, any methods of management, to be effective, must be able to meet the constant changes in industry. Organization for change means opening men's minds, not only to meet, but to anticipate, new forces and to control them. They learn to say that nothing is impossible. Greater than any changes in industrial methods that America is giving to Europe and the rest of the world is this change of men's minds."

This being the case, and considering European standards of living, what happens to our economic lead in America if Europe strikes our stride in these matters?

Both from a world standpoint and from the competitive situation within our own borders this is the case for the industrial engineer.

### Function in Business

What is the function of an industrial engineer in a business? The answer is SPECIALIZATION.

The industrial engineer must be, through experience, trained in the analysis of production problems, he must know the technique of wage incentives, he must be competent to observe and to formulate methods for the control of costs as related to labor, materials, overhead costs and marketing.

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Because plant executives in most businesses have many duties their minds are frequently so closely focussed to their problems that they get used to conditions as they are and fail to observe possible corrective improvement. The words of Bobby Burns are just as true applied to businesses as applied to people:

"Oh wad some power the giftie gie us  
To see ourselves as others see us."

We have observed many, many times that most executives are too busy to devote time to specialized investigation. Why do the great corporations organize and finance research on products and materials on a great scale? Because they have found it profitable to specialize this effort and to divorce it from the current continuous effort of the day's business. Just so the industrial engineer, with absolutely no routine duties, and given an experienced analytical mind is able to concentrate his intelligence on One problem for solution.

He must observe, think, design, try, adjust and finally formulate a simple and effective control of the activity under study.

### Many Problems Common to Business Concerns

Now, of course, each man says to himself, "But my business is different." Let me read you some questions which you may answer to yourselves; you are no doubt representatives of many industries. Do these questions fit YOUR business?—

#### PRODUCT:—

1. How many lines are made? Too many?
2. Is there seasonal production?
3. What is the relative profit on various lines?
4. Is more specialization possible? Desirable? Profitable?
5. Competition? Location of markets? Distribution?

#### FOREMEN:—

1. Has every foreman a financial incentive? Can you measure his performance and pay him for results?
2. Do they know their department expenses? Labor costs?
3. What are their duties? Are they busy? Too busy?

#### MEN:—

1. Are all your workers paid for performance?
2. Who sets your rates? How? Are they fair to you? To them?
3. Do men get their own supplies? Do they wait? How much?
4. Do your workers hold back to influence rates?
5. Have you time studied your operations thoroughly?
6. Are your wages Low? High? Do you hold good men?
7. Is labor turnover costly? In dollars? In quality? In sales?

#### MATERIALS:—

1. Is material planned ahead of the job?
2. What does waste cost? Is it preventable? Has it been lowered?
3. Do departments? Workers? Wait for service on tools? Materials?
4. Do materials vary in quality and raise costs?

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### COSTS:—

1. Are you sure of your material costs?
2. Are labor costs per product actually known?
3. Are overheads actual or estimated?
4. Are their large variation costs? Are you sure they are right?
5. Can you afford business at discounts? How much discount business?

Certainly these problems are nearly all common to any manufacturing business.

### Studies for the Industrial Engineer

The competent industrial engineer must be concerned with all these things, with using the RIGHT type of wage incentives and with simplicity in these matters too. He must consider also and effect a control for factory executives. How comparatively easy it is to measure the effectiveness of a worker who performs say a repetitive operation and whose effort is measured by the number of times he does this operation. But design a measure of the effectiveness of a foreman and we find all these factors and many others.

- (a) Quantity of production.
- (b) % of defects due to
  - (1) defective materials.
  - (2) " workmanship.
  - (3) " machines.
  - (4) poor control of routing.
  - (5) poor design.
- (c) Labor turnover and consequent high costs.
- (d) Progressive improvement over past performance.

To design a measuring stick for the performance of executives is a different story and one of the most important things industry has to do.

For a minute let us consider another specific phase of the activity of the industrial engineer. What is the economic lot size for production in a plant? This is an important consideration from the standpoint of:

- (a) Conserving capital.
- (b) Turnover of inventory.
- (c) Labor cost reduction.
- (d) Sales services.
- (e) Defects and repairs.

From continuous observations of the operation of a plant all these effects the experienced engineer cannot help but observe, and a study of such a problem produces very definite and logical results in many cases.

### Possibilities in Canada

Specialized industrial engineering in Canada has been very little developed indeed. Statistics show that in the United States, less than half of the industries of the country employ wage incentives of any

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description, and only a very small percentage of concerns indeed utilize consultant services; but it is noteworthy that of those who do the great majority are not only prosperous leaders in their fields but are large and progressive concerns.

The field of this work in Canada is very broad indeed, and undoubtedly there is a growing appreciation of the usefulness of the outside view point of the industrial engineer.

The relationship of the engineer in a business to which he is temporarily attached is really a functional one. He fills no part in the line organization of the concern. He is an auxiliary service to supplement the efforts of the existing executives and in many cases is able to accomplish results because of his very detachment from the personal side of business.

He is paid to put daylight into the dark or even dim recesses of the organization, and in so doing he must certainly be a devotee of the truth and must deal only in facts, not in hopes, or hunches. As a functional auxiliary there must be a clear understanding of his authority. The management must of course have confidence in the sincerity of his efforts and the executives must be broad-minded enough to realize that the engineer is there to supplement with his broad and peculiar experience their own efforts. Above all on the other hand the engineer must be patient and appreciative of the fact that results will come with co-operation and that an arbitrary attitude is the first step to failure. He must always listen to and weigh the story of past successes or failures in the problem at hand, but once he has sized up the situation then confident logic should steel his resolution because certainly the changing of old habits is not usually a popular pastime. Moderation and sincerity of effort, however, soon brings the confidence of executives, and as one problem after another is tackled the road becomes easier.

Very often one finds a business which has all the potentialities of a vigorous, progressive machine, but to draw an analogy in spite of plenty of gasoline, a finely machined motor, new tires and oil, water and grease, there is a lack of snap in the battery. It is only one of the units in the machine, but unless this essential fire is present nothing new happens. Perhaps the answer is age, perhaps not enough age, perhaps lack of interest, or natural energy. The cure then is to revise the division of executive control, to perhaps secure a loaner to get the machine in motion until the spark builds up in the battery or the breaker points are shining again.

There is nothing so stimulating as the little word why? If an organization can be trained to ask why to everything and can carry its Why into action, progress is sure. Research is only another name for why? And it is a simple matter to act on facts, once they are known. Therefore, the engineer who can succeed in building up organization enthusiasm, by creating an enquiring attitude toward the old and familiar, who can picture ideas of future accomplishment and create the desire for fulfillment, is bound to have the friendly and vigorous support of the organization he finds himself attached to.

## A Members' Problems Night

Report of Meeting of Montreal Chapter, March 6, 1930.

IT had previously been decided to conduct our meeting of March 6th as an open forum for the presentation of members' problems, and for the mutual discussion of difficulties and questions as advanced. In response to a questionnaire sent out during the preceding week, a large number of questions had been suggested. These had been reviewed and a representative list had been compiled to form the basis of the evening's work.

Professor R. R. Thompson of McGill University, President of the Society, occupied the chair. He introduced the problems, and in many cases summarized the opinions of the members as they were expressed. The latter was not the easiest job, for the discussion was full and free and the opinions were varied. A current record of the principal comments was kept and runs somewhat as follows:

### 1. Direct Material

Prof. Thompson—"The first question is this, gentlemen: 'Where direct material varies considerably in price, and where processes are numerous, it is impossible to find the actual cost of each article. Scheduled rates must be used for charging the direct material when going through the processes. How is the actual cost of the inventories at the end arrived at?' Now I take it, gentlemen, where inventories are referred to, they are the inventories of partly finished goods and finished goods."

Mr. H. K. S. Hemming, B.A., C.G.A., C.P.A.—"What do you understand by direct material?"

Prof. Thompson—"I should say the material out of which the article is made—the material that is absorbed into the finished product."

Mr. Hemming—"It seems to me, Mr. Chairman, that he has put two very strong statements in his question. In the first place, he says that it is impossible to find the actual cost. Nothing is impossible; if you work hard enough the figures are easy enough to find. In the second place, he says that scheduled rates must be used for charging the direct material when going through the processes. I have had that experience in silver-smithing, and at the time when the prices of silver varied very rapidly. I remember within three months they ranged from 148 to 180. That makes figuring the prices of forks, spoons, knives, etc., utterly impossible. So what we did was to figure the material and put down the average price as the prices changed up and down. Of course it may be dependent on the regular value of the material. In that case, the silver was far greater than the cost of labour, whereas if you are using a group price on a small article it would be just the reverse, but I think you can get at it by dividing your cost into two parts."

Mr. D. M. Farish, C.A., Northern Electric Company Limited—"I will give you an example. I knew of a case where there were twenty-two departments. They were manufacturing doors, suitcases,

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harness, and all different varieties of wood, leather and tin. That presented a big problem because an article would start in the case department, later go to the cutting and stitching, and to the leather department. Sometimes one article would go through one department; others would go through sixteen. There were the processes of testing the leather before cutting it, because every inch of leather must be tested. We had to establish a certain standard of labour for a certain number of weeks. Once an article touched a particular department of course the article was direct material going to it. We knew the price and every week we had to ask the amount of labour and the amount of articles produced. Of course the material varied but the production was about the same."

Prof. Thompson—"I presume this means that the basic price changes on the particular article. This would be the situation, gentlemen, where you take the case of some electrical contraption with rubber, copper, lead and a few other things—I suppose it is quite possible that the price of lead sometimes varies a good deal in a few weeks. Even in a small article you have perhaps the same standard of lead which has been bought at two different prices, and I can quite see that it is impossible to follow the actual cost for any particular lead through the processes. I think the only thing to do is to fix a price at say the start of each period. You can simplify your work and you get just as accurate results."

Mr. Farish—"We establish a standard price on copper and charge all our copper on that price. We know each month what the figure is so that we can tell each time. Of course we don't use that in selling. The same applies to lead or zinc where prices vary considerably and the quantity used justifies it. The basic price of copper went from 18 to 24, then sank down overnight. We use somewhere from fifteen to twenty million pounds of copper a year. I think that can be applied in any business where there is a basic or more than one basic material which represents a very large amount of money."

Prof. Thompson—"What would you suggest doing in your concern with spare parts manufactured for stock? You might have a collection of spare parts which include a little of copper. Your scheduled rate for the copper has been a certain figure. The cost of the finished parts manufactured will be on that basis. There is a drop in the value of copper. What is the best way at getting the change in the price of spare parts?"

Mr. Farish—"We do that by an adjustment. You can deal with them by percentage. We manufacture anywhere from 30,000 to 50,000 piece parts; to try to test those would be impossible."

Mr. A. Lanthier, The Rolland Paper Company Limited, asked about the paper industry, said—"I have not must to say about that because in our industry we have no such condition. Our prices do not vary a great deal and I am not very familiar with such a situation."

Mr. Wilfred Holmes, Howard Smith Paper Mills Limited—"All you can do is to take a representative figure and apply that on the standard cost. At the end of the month the inventories which you have on hand will go into your regular cost. We do not have many materials that fluctuate very much. In the unit class you have a difference of only about two or three cents."

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### 2. Standard Costs

Prof. Thompson—"Well, let us pass to the next question—"What is the exact meaning of "Standard Costs"?" That is an elementary question, but it is a good one. In my long experience in giving lectures I have been asked many questions, and I think 99.9% of them have been good ones, so don't be afraid that you are asking an unimportant question."

Mr. Farish—"As far as I am concerned, 'Standard Costs' is a measure of efficiency. In manufacturing costs there is really what you might call the predetermined cost of an article which establishes what is looked upon as the highest manufacturing efficiency for that particular article, though this efficiency is not put to the point where you cannot realize it. If you are going to make an article you have to lay out and use certain quantities of materials. You have the price of your materials and from that you can figure out your material costs. Secondly, you know exactly what process it has to go through, and you can then figure your labour cost. You can then establish your overhead. Past experience establishes cost, which should be based on real manufacturing efficiency. 'Standard Costs' to me is purely a measure of efficiency—if it is manufacturing, it is manufacturing efficiency; if it is for distributing costs, it is distributing efficiency."

Mr. Hemming—" 'Standard' in that case can surely be only in one institution. To-day changes in method are almost revolutionary. One person makes 1,000 while another only makes 100. One person pays five times as much wages as his competitor. How can you establish the cost of anything which is made in more than one place?"

Mr. Farish—"Referring to Standards as measures, they are purely and simply for the company for which they are made. They are not measures for another company."

Mr. Hemming—"You mean 'Standard' for your own institution?"

Mr. Farish—"Certainly."

Mr. Lorenzo Belanger, C.G.A., C.P.A.—" 'Standard Costs' is a measure of efficiency for a certain price."

Mr. Farish—"It is purely a measure of manufacturing efficiency unless you have a monopoly."

Mr. Belanger—"A measure of efficiency, I think, is a measure of the profits you get at the end of the year."

Mr. Farish—"Standard Costs is for an individual article. If you consider all matters together you may get your profit. If a concern is going to turn out a large number of machines of a certain type I think the procedure is as follows:—For the manufacture of those find out how much each operation costs and how much time is taken for each machine with good workmen. Of course I know that for the first one you make the time taken will be longer than the time taken for the subsequent ones. You have to fix your Standard, even though you might have to adjust it later on. For instance, take the steel industry. Suppose you were manufacturing something like spikes of a certain kind. You know by past experience, steel being a certain price, spikes ought to cost you so much a thousand. That is your Standard. Then in starting your work of manufacture, you must keep the cost down to the Standard."

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Mr. George T. Bowden, Steel Company of Canada Limited—"I have had no experience with Standard Costs, but you could carry out a system such as you suggest in the steel industry. You could take a quantity of spikes and set a price. Production would then be a result of efficiency."

Mr. Farish—"I would like to point out that the cost of material from the manufacturing efficiency standpoint means nothing. The factory has nothing to do with what is paid for material. Purchasing is done in an entirely separate department. The purchasing department and administrative department have nothing to do with the operators who are responsible for the manufacturing efficiency. Consequently, you charge your standard price for material into your cost of manufacture. The way to measure your material efficiency from the manufacturing standpoint is by quantity. You draw so much material according to your lay-out, allowing for variation for scrap, spoilage, and other things which naturally come into the manufacturing. If you use more than that quantity, then you are a failure. If you use less your efficiency is effective on the right side. Where you use large quantities of different kinds of material these usually take up your variation between actual and standard. If they don't, you get two manufacturing costs that vary."

Mr. Holmes—"We have a Standard Cost system that has been running for a number of years. Every six or eight months the standards are revised and new distributions are made over the various machines. After boiling everything down it is surprising that the variation between actual and standard is very small. With the paper industry a Standard Cost system works wonderfully well. Variation in material is not very great and if the standard is revised every six or eight months you can always rest assured that your Standard Cost System will give you a reliable idea as to how much the finished article will cost you."

Prof. Thompson—"I like Mr. Farish's definition for a brief definition—That 'Standard Costs' is a measure of efficiency."

### 3. "Selling" Cost Accounting

Now we come to the next question—" (a) What are the best arguments to use in order to persuade a client to institute a system of Cost Accounting?" and

" (b) Would it not be well for the Canadian Society of Cost Accountants to publish a booklet for broadcast distribution among the manufacturing, wholesale and retail firms of the country, directing their attention to the need, in these days of keen competition, for accurate cost accounting?"

Prof. Thompson—"We have just been sending out a questionnaire, gentlemen, to a number of manufacturing concerns throughout the Dominion, to try to get some idea of the condition in this country as to cost accounting. This country undoubtedly is at the start of a big development from the industrial standpoint. We have seen a lot of mistakes south of the line and in the Old Country, and in other manufacturing countries, so our idea was to first of all see what the condition of affairs is in Canada, and see how many people have good cost systems and how they got them, and then we can arrive at what work ought to be done. This is very pertinent—"What are the best

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arguments to use in order to persuade a client to institute a system of cost accounting.' Some of you men will no doubt want to get your own concern to introduce a better system than the one you have at the present time. I believe there are concerns still in the country who really have no proper cost system."

Mr. Hemming—"These are my two questions. As a public accountant I have found the greatest possible difficulty in persuading my clients to adopt any cost system. In all the large firms cost accounting is one of the first things they regard as necessary, but in smaller institutions they regard it as an expense—and I think, about 95 % unnecessary expense. I have been able to see that the investment of money in a proper cost system will yield a greater dividend than anything else in which they can invest, and just now when we are going through a revolution in methods in industrial and commercial life, and even in agriculture, it is more than ever necessary for them. When we take the several standards of living in the different countries of the world and the general objection to gross production of other countries, how, unless we know well the costs, can we possibly hope to come out on the right side from year to year? It is on this fact, then, I asked this first question as to how best to put it to a client, and then if we could arrive at some real good series of replies to that question, if we could bring out an established book for general distribution by ourselves and by the associations of all kinds, it would be to our own advantage and still more so to the commerce and industry of the country."

Prof. Thompson—"I have had a little experience in installing Cost Systems, and I can honestly say this: I can think of quite a large number of concerns which had a Cost System installed, where they found out waste that could be stopped and where they found out that the actual costs were quite different from what they thought they were. One manufacturer in this city said that he had been carrying on for a long time without any Cost System. I said, 'Your profits may be a certain figure, but they might be greater.' If you have no Cost System you are guessing, and don't know whether you have made a good guess until you come to the end of six months. Even then, if your guesses are wrong and you have not made anything like the profits you thought you would, that is all you have found out. You don't know where it has gone wrong—you merely know it is wrong. You are merely guessing. Modern competition does not allow for very much guessing, but you can't convince some people until they are in the bankruptcy court."

Mr. Hemming—"Two chief objections to the installation of a cost system is that it is necessary to keep accurate accounts and to keep proper records of all materials used. Take, for instance, the clothing trade. When they lay out 30 or 40 sets of cloth for the workman, he is told to measure them out. He makes a very great objection to doing that. A third objection is that at least one clerk must be kept to record the workman's time and to figure the costs."

Prof. Thompson—"The first thing they say is: 'This is going to mean another batch of forms.' The main thing to me is that until they have a proper cost system they are guessing. You might bring up some 'awful examples.' For instance, at one time I knew a man

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who ran two cars, but now he is keeping a boarding house and doing the cooking. He had been a manufacturer and he knew all about what the cost was—he had everything in his little note-book! That is where his note-book landed him!"

### 4. Items in Manufacturing Cost

Prof. Thompson—"Another question: 'Should Selling and Distribution Costs or Charges against General Administration, ever be included in the Manufacturing Costs?' I presume in this case the goods are being manufactured for inventory. If the goods are sold before they are manufactured—for example, in the printing industry—the matter is not quite so important. I do not like the idea of including in your Inventory the costs of Management. Further, how can you include the selling and distribution costs when the goods are not sold?"

Mr. Belanger—"For the information of the members, I must say that several of these questions will be put up to the National Association of Cost Accountants next fall."

Prof. Thompson—"The problem really is: 'What is Manufacturing Cost?'" Professor Thompson then wrote the following definition out:

"Cost of finished goods—all costs of production until goods are in a condition ready for sale and at the door of the finished goods warehouse."

Mr. Hemming—"Some take exception to the second line of your definition. If you have a varied class of goods, then the packing becomes part of the distribution costs, whereas if you have goods that are put up in cases in the factory, then the packing becomes a factory cost."

Prof. Thompson—"I sheltered myself behind this condition: 'goods ready for sale.' Consider cigars, the finished article is the 'Box' of cigars."

Mr. Hemming—"Then you would not have to add the case that the box was in to your cost?"

Prof. Thompson—"If you were selling fluids like alcohol, they are all cased in the factory. Certain acids have to be packed in carboys before you can sell them. The article that is sold is the carboy full of acid."

Mr. Lanthier—"I think when you come down to the packing of the articles you are raising a point open to a good deal of argument. Generally the container is sold separately from the goods and you get a credit for it provided it comes back in proper condition. If the article is generally packed in the factory in a standard package that package can be included in the cost. If the package is put on afterwards, then it becomes a distributing expense."

Prof. Thompson—"I am very keen on keeping the grouping of the expenses as simple as possible. I think it is best to keep the factory operations together with the costs of running the factory, and to keep the selling operations together in a separate group, and the delivery and shipping expense together in another group. Don't put shipping charges into the factory."

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Mr. J. P. Masterson, Canadian Industrial Alcohol Company, Limited—"I think that goods are finished when they are at the warehouse ready for sale. In our industry, in the case of liquor, you could hardly consider that it was completed until it was in the case with the label on. Our packing costs often represent more than the actual whiskey contents. Every industry may also be in bulk business. We ship bulk alcohol in drums which are returnable. If the container has any real value it is returnable and does not form part of the cost. Where the product has to be placed in a container which is not returnable, such container may be written in as part of the cost."

Prof. Thompson—"If the container is of value and is returnable to the manufacturer it should not be included in the costs of finished goods."

Mr. Masterson—"Bottling manufacturers charge us 50c each for crates. They are returnable. They buy these crates at about the price they charge us, and it is just a storage item as far as they are concerned. It is the same in allied industries in shipping packages with a returnable value. In the vinegar trade the barrels make their profit or loss as they must have so many to handle the business. I have had quite an experience in returnable containers. We charge the customers so much for the package."

Mr. Farish—"We have a good illustration of that in our cables. You can't sell cable unless you put it on a reel. We do not treat the reel as part of the manufacturing cost because we bill the reel separately to the customer. If he returns it we give him credit for it less freight and any damages. I don't think you can lay down any hard and fast rule. The answer is to use good common sense."

Mr. L. Rhodes, Consolidated Lithograph Manufacturing Company Limited—"One of our products is playing cards. In this case the package may amount to more than the cost of making the cards. You wrap them in a classy wrapper which is sealed with a very nice gold seal. They may be enclosed in a solid leather case. The leather case itself would likely cost about \$1.00 and the cards might be only worth about 25c. The package costs more than the cards."

Mr. Farish—"You get that in almost any industry. Take lamps. They are generally packed in a small cardboard box for protection. That is probably a cost of manufacture. You have to take every industry with its various difficulties. There are certain principals which we all believe you should follow, but even those should be broken where it suits your industry."

Prof. Thompson—"Charges against General Administration.' If this means that a small percentage of the administration can be allocated as a part of the costs of administering the factory, I can see that that is permissible, but I think that is about as far as you can go. I still feel inclined to keep all the administration by itself."

Mr. Rhodes—"Selling expenses are really part of our cost, and we include them as such. The time and ability of the salesman does govern our manufacturing to a certain extent. A customer will want a job in, say, ten colours. We find out that by giving him slightly different shades we can put the job through the press about five times, so that they will give us ten colours, but not actually the shades specified. It is up to the selling ability and the knowledge of that

## A MEMBERS' PROBLEMS NIGHT

salesman to convince the customer that we can get somewhere near the shades that he requires by using slightly different inks, and his success has a certain bearing on our factory production cost."

Mr. Hemming—"There are four or five different prices from the wholesale to the retail and sometimes to the jobber and for export trade. None of those channels of sale have anything to do with the production costs. The producing cost is more or less of a standard because the competition between the producer and the work people makes a fair standard of wage, and of course is higher or lesser according to their ability, so that we can manage to get a fairly good factory cost. On the other hand, the administrative end of the business varies tremendously, as we know. We find that those who are in charge of the business are drawing all kinds of salaries whether they are entitled to them or not, so that if you add these to the factory cost you are going to have tremendous variety, and it would not be fair to the factory. One factory's cost of production ought to be pretty nearly the same as another for the same quality of goods."

Prof. Thompson—"In the lithographing industry we might say that the goods are sold before they are manufactured. But apart from that, I am absolutely against carrying administrative charges to the cost of goods into inventory. You carry forward general administrative and selling charges into your inventory for the next period and no sale has been made yet."

Mr. D. R. Patton, C.A., R. Schurman & Company—"In connection with Mr. Rhodes' industry, the point might be further illustrated. Firstly, take the case where a salesman is setting up a particular job and has to come back several times before he satisfies his customer. The salesman's time must be taken into consideration as a factor. His time might vary greatly even with the same class of sale, and if you are to arrive at a Job Cost I would think this time would have to be taken into consideration. Secondly, it has always been pretty generally accepted that the manufacturing cost is through when the goods are delivered at the door of the finished goods warehouse. But let us take Mr. Masterson's industry or, better, food-stuffs—say pickles. Suppose they are in barrels and are placed in the finished goods warehouse. In this case the manufacture would be made some time ahead of the sale. If these had been put up and sold ready packed in bottles for re-sale to the retail trade, then the bottle containers would be taken in as a part of the cost. In our case we had intended the sale to be made in the large vats, but the condition of sale changed so that they would have to go back and be repacked. In this case they would have to be returned to the factory from the finished goods warehouse and repacked, the cost of packing now being added to the original cost as set up."

Prof. Thompson—"Supposing you manufacture goods. You think you are going to sell them in a certain condition and the manufacturing cost is \$1,000. You get a certain price for them and you find out you have made a mistake. You have got to put those goods in another condition. I should say that the expense, a certain amount of which is waste, should be written off. Selling of them in a different condition amounts to turning them back a few processes and then bringing them back again."

## COST AND MANAGEMENT

Mr. Patton—"Food-stuffs are packed when the food is fresh, and if your estimate is wrong you have to bear additional expense."

Prof. Thompson—"Selling expense is selling expense."

Mr. Farish—"Generally speaking, I would not say that there are not exceptions—but in my opinion you should not charge to the factory the expense over which they have no control."

### 5. Allocation of Selling Costs

Prof. Thompson—"The next question we will take up is: 'Under what circumstances should Selling and Distribution Costs be allocated to specific lines or products, and on what basis? Should distribution be based on cost of article, on difficulty of selling . . . etc.?' I think this 'Under what circumstances should Selling and Distribution Costs' has something to do with the last meeting where Mr. Carruthers gave us an address about selling automobiles."

Mr. Masterson—"I think this refers to profit by lines or groups of products. In your Selling and Distribution Costs there are direct selling expenses applicable to direct lines. In that previous point about reconditioning goods there are different ways in which you can handle it. There is a loss which might be chargeable to the bulk pickle department. In our industry we have profit by individual brands. Our lines are limited so we can do that. Each manufacturer can establish groups of products in order to get down to profits by these groups. In the manufacturing cost you always have a unit of one article, and in the distribution of selling costs and general administration I think that the closer you can get down to having these allocated on a unit basis the better. Where you distribute general overhead charges on the selling price of the article the higher priced article stands more selling price, where as the unit sold might be the same as a cheaper article. When I speak of profit by brands it is the approximate. By going through your selling and overhead accounts there are numerous accounts that you can allocate specifically. To illustrate—in our newspaper ads we always specify a particular brand. For general overhead we allocate on the unit basis, the gallon or box. We are able to get down to a profit by brand."

Prof. Thompson—"In talking about the value of a cost system it is undoubtedly of value to know the lines on which you are making profit and on which you are making a loss. The cost of manufacturing might be low but the difficulty of selling so great that it would be well to drop a certain line. There are definite selling expenses which you can allocate to different brands, and I would avoid if possible basing the selling purely on a rule of thumb method."

Mr. Masterson—"Distribution cost is one of the biggest costs of industry to-day."

### 6. Handling Charges in Branch Warehouses

Prof. Thompson—"The next question: 'How should freight and handling charges on finished goods in Branch Warehouses be handled?' I take it that this means that the goods are finished at the Head Office. They are sent out to a Branch. The goods are taken into the inventory. Should you put down to the factory cost a certain amount of freight? A great deal depends on where the Branch is situated."

## A MEMBERS' PROBLEMS NIGHT

Mr. Farish—"You can manufacture a product in Montreal for \$10 and sell it for \$11. Your investment is \$10. Take the article in Winnipeg. It costs you 50c to get it there. If that article costs you \$10.50 in Winnipeg you are therefore entitled to that 50c plus a profit."

Mr. Belanger—"Sometimes an article will yield you less profit when shipped to Winnipeg than in Montreal. Take the clothing business. You cannot get a cent more out West than you get here. The advantage is to have a factory at Calgary. The extra expense will have to be made up in the reduction of your overhead. You may get enough business from the West to reduce your overhead in the manufacturing process. It costs more but you get the same return."

Mr. Hemming—"It seems to me the cost of sending the goods to the branches except as included in a proportion of the general overhead of administration, is not a cost of manufacture but of administration."

Prof. Thompson—"At what price would you take the goods into the inventory of the branch factory—factory cost or factory cost plus cost of transportation to the branch? If the selling price can be varied according to the location of the branch it might be a wise policy to take goods into the branch inventory as factory cost plus cost of transportation, but if there is the same price ruling throughout the country, then at factory cost."

Mr. Farish—"Take cables. You ship it to Winnipeg and pay freight on it. Supposing instead of manufacturing it you buy it from one of your competitors in Ontario and ship it to Winnipeg. What does it cost you at Winnipeg? Do we charge you freight? Is it part of your cost, or isn't it?"

Mr. Masterson—"When you include your freight that you pay out you increase your selling value. If you happen to do a lot of business, say 50% at Vancouver and 50% at Montreal, your Vancouver selling values are going to be 10% greater. In some instances we charge the freight to the warehouse stock account. We are shipping to Havana markets. It costs us 20% to get the goods down and by an increase in price we are only getting a reimbursement of freight and insurance that we have paid out."

Mr. Farish—"We send our own material to Winnipeg and we bear the cost of freight. We also buy certain materials all over the States and Canada. If we take it to Winnipeg for sale there we would add the freight to our cost."

Prof. Thompson—"The general opinion seems to be that supposing goods are sent from here to Honduras. Goods are more valuable in Honduras than they are here in Montreal. You get a better price because they are not so easy to get there as they are here. Your inventory may be taken at factory cost plus cost of transportation."

### 7. Obsolete Materials and Parts

Prof. Thompson—"The next question is, 'Should obsolete materials and spare parts be charged as a Manufacturing Expense, or be regarded as a deduction from income?' Supposing you have manufactured a lot of spare parts, taken them to a store and find that they are all useless, and that it is necessary to put them back into their raw state and sell them for scrap. Your loss here would belong to the sales department."

## COST AND MANAGEMENT

Mr. Farish—"It depends whether the material is put up on account of definite orders. I believe in those cases where it can be traced back that that department should be responsible for its error in judgment."

Prof. Thompson—"A good principle is to charge it against the department that made the mistake. I would say that it should not be put into the manufacturing account but should appear in Profit and Loss as a special item. Supposing you buy some kind of raw material and you find that the whole stuff has gone bad. That should go to Profit and Loss as a special item."

Mr. Belanger—"Take the clothing business with its seasonal goods. There is a good deal of waste in cutting, but this can go into samples."

### 8. Selling and Distribution Costs

Prof. Thompson—"The next question is, 'When is it necessary to apportion Selling and Distribution Costs to different classes of customers, and how should that be done?' That is very like the question of the selling and distribution costs already discussed."

Mr. Hemming—"Take the export trade. Sales here are generally on a lower profit than with home trade. Are you going to apportion on the actual cost or on a problematical cost?"

### 9. Loose Tools

Prof. Thompson—"The next question is, 'What is the best way of dealing with loose tools in a factory? Should they be written off as issued, or debited to departments and periodically re-counted?'"

Mr. Holmes—"They should be written off as issued."

Mr. Hemming—"In a well-organized jewellery factory every man has a drawer which he locks. Tools are bought for him at wholesale. The best way is to have a tool room and every man is required to look after his own tools."

Mr. Patton—"In some industries tools are a very big item, and if those are taken at a conservative value, I don't see any objection to including them among the assets. You should issue enough next period to take care of any discrepancy on account of tools which have disappeared."

Mr. Farish—"We have two classes of tools, one of which is a considerable investment. We charge those like a machine, keep regular records of them, and depreciate them in the regular way. Any adjustments necessary are taken care of. Loose tools don't amount to a great deal compared with our other assets. We simply charge them off to the department as they are issued, but each year we take an inventory of them."

Prof. Thompson—"You keep a register of tools that have been issued to the department so you have some idea as to what you would have."

Mr. Farish—"We keep a check, but we see that nobody gets away with them. We have some 7,000 employees; there are quite a few loose tools lying around, and it is our chief concern to see that nobody gets away with them."

Prof. Thompson—"The most conservative thing, of course, is to write them off as issued. Keep a record of the most expensive ones and have a periodical recheck."

## Finding the Hidden Costs in Materials Handling

From a talk by J. I. McCORMICK at a meeting of the Materials Handling Division of the A. S. M. E.

(Reprinted from Canadian Machinery and Manufacturing News.)

**I**NDUSTRY holds its present position in the industrial world because it has adapted and applied mechanical conveyances, standardization, single-purpose machine tools, centralization of like products into one-plant set-ups where mass production has germinated, and grown plants that are a source of pride. With this progress, ultimate customers are educated to accept a standard product, and engineering and sales policies are developed that have revolutionized industry. All this, along with the attitude of the workmen, and their acceptance of the tools handed them, has made industry on this continent the envy of the world. Some of our keenest competitors in the world markets have adapted our approved methods.

To-day no executive questions that a proportion of his unit costs is tied up in handling. The exact per cent varies in individual plants, but the author through association with some five plants, which have included automobiles, small parts, and electrical apparatus, has accumulated sufficient data to say that approximately 80 per cent of the labor contents in unit costs is traceable to handling. Of this 80 per cent, 50 per cent is taken care of through operations on the floor, 12 per cent has to do with receiving, transferring to plant, transportation to the first operation, and packing and shipping; the remaining 18 per cent is a most fertile field for reducing unit costs, and one which presents problems that are answered and solved only after hard, diligent study.

A plant-planning engineer's job would be easy if all his layouts could be centred around quantity production; allowing mechanical handling and gating throughout, but unfortunately there are many plants, and many activities within plants, due to lack of production and certain inherent characteristics of the product itself, which do not lend themselves to any elaborate conception of materials handling and manufacturing processing but reduced costs must be forthcoming under any system of manufacture. The cost trend must be established downward, and any plant of fair organization can lay out a new plant for a given product under ideal manufacturing conditions. When finished, this will be the last word in plant and manufacturing facilities. It takes a high-calibred plant organization, however, to take an old plant manned by 10- to 25-year old veterans and swing them to new methods and turn out products at a unit cost comparable to the more fortunate competitor. This can be done, however, and within reasonable expenditures by judicious modernization.

## COST AND MANAGEMENT

### Diversified Plant

The Westinghouse plant at East Pittsburgh is a diversified plant, manufacturing, in some form, a wide range of electrical apparatus. It covers approximately 5,000,000 sq. ft. of floor space scattered over a radius of eight miles, with six separate plants serving the main plant.

The foundry produces approximately 3,000,000 lb. of castings a month. The punch shop ships approximately 3,000,000 lb. of punched material. Shipments during 1929 averaged 11,200,000 lb. a month with an average of seven handling operations for each, which means that within the plant approximately 78,400,000 lb. are handled each month. Adding to this the scrap ratio, there is coming in and handled through the plant approximately 42,336 tons. Manufacturing quantities average 50 to 100 pieces in the main items. This tonnage does not include coal, ashes, incoming maintenance material, or machine tools, which amount to approximately 70 cars a month.

Materials handling is a real problem to this company, and is placed by the management as of paramount importance throughout the East Pittsburgh plant. It is of such importance that two distinct departments have been formed for materials handling. The first is the transportation department, whose head, C. A. Fike, presented a paper at the spring meeting of the A.S.M.E. in 1928, at Pittsburgh. This department functions between plants and brings the bulk to the first operation on the floor, it also handles the semi-finished and finished product from department to department, but is not concerned with intra-departmental movement. The second is the plant-planning and layout department. This with the production department schedules and plans and plans the material movement through to the shipping platform.

The objectives at East Pittsburgh through materials handling set-up and floor layout is to keep the work at one level, as it is found to cost \$0.0036 for a floor lay-down and pick-up again to machine or bench level; also keeping the work in direct float and scheduled gait. Of course, these objectives are fundamentals in specialized plants, but are real problems when applied to the diversified plant.

### From the Time It Arrives

It is planned to handle material mechanically as soon as it reaches the plant. In the punch shop, the first machine is separated from the broad-gauge track by a sliding door only, so that the sheet is unloaded directly to, and through the coating machine, ready for storage ahead of shearing. This eliminates one handling, or a movement of 3,000,000 lb. of sheet stock a month.

The product coming from the foundry is loaded into boxes that fit the inter-works transportation, either industrial gauge or trailers. These boxes are placed at the run-off from the last cleaning operation. The inspector pushes the cleaned castings from his bench into the box, where they are piled on a broad-gauge car for East Pittsburgh. The car is delivered at a point where an overhead crane will deposit the box of castings on an industrial car and lift truck or trailer for delivery to the first machine operation. The company is getting away, gradually, from industrial railway and lift trucks for the inter-works

## FINDING THE HIDDEN COSTS IN MATERIALS HANDLING

transportation by employing tractors and trailers. This means wider aisles, ramps, driveways, etc., throughout the plant. The economies that have been introduced more than justify the change-over. The saving is estimated at \$33,000 a year under present plant loadings.

The correct answer to any handling problem is obtained through analysis of the factors involved in production:

1. Floor space available.
2. Physical layout.
3. Receipt and storage of raw material.
4. Distribution of raw material and element parts.
5. Classification of machine tools.
6. Machine loading.
7. Activity.
8. Design.
9. Separation of sub-assemblies.
10. Separation of specials from standard.
11. Scheduling.
12. Complete assemblies.
13. Processing.
14. Inspection and testing.
15. Physical properties.
16. Storage of finished parts.
17. Shipping.
18. Investment.
19. Economies.

Each of these factors usually presents different problems in handling, and when analyzed will give the desired method to use. Each factor must be treated separately and matched with the type of handling equipment best adapted to it. There are many factory managers and superintendents who still cannot see a place in their plant or department for mechanical-handling installations which they have seen elsewhere. It is not because these men are dull. Instruction on how to use equipment has been unmethodical and too fragmentary. The right application must be made of suitable co-ordinated, material handling equipment. All have seen applications of handling equipment unsuitable, expensive, and nothing short of an "economical crime."

### Engineering Has Advanced

Those who have lived with reduced costs will recall that until recently handling was not considered in the analysis of those factors which made for profit or loss. The main points of consideration were material, major machine tools, tool fixtures, and design. Crude methods of machining, high cost of materials, and, above all, the design engineers were criticized for the cumbersome designs with excessive weight and impractical tolerances and methods to obtain them. Engineering, and the art of manufacture, have advanced. Engineers have reduced weights and costs on large apparatus through fabrication, where every piece or order may be entirely different, involving no more waiting on patterns and castings.

## COST AND MANAGEMENT

All of the foregoing are factors in costs that are on the surface and which are obvious to those who look, but under the surface are hidden costs. Those costs cannot be other than those of overhead, false economics, and handling.

Those factors which would be given an algebraic expression for a handling constant, eliminating hidden costs, those intangible costs that are continually paring down profits and reducing the handling expression to its lowest terms are as follows:

A=Cost of handling from car to storage.

B=Cost of handling from storage to first operation.

C=Cost of handling from first operation, or manufacturing, to shipper.

Hidden factors involved:

X=Rehandling cost for "A."

Y=Rehandling cost for "B."

Z=Rehandling cost for "C."

W=Minimum handling costs  $(A + B + C) + (X + Y + Z) = W$ .

1. An outstanding hidden item difficult to measure is the handling cost of stock which does not have regular attendants; crews, or individuals are shifted from other activities, periodically. Where one attendant is assigned to the entire section, modern handling facilities may not be considered justifiable, whereas, analysis may show that the operator is burdened with handling and, at times, several men are found helping the single attendant. Summarizing the time spent annually, it is found equivalent to two, or more attendants. Therefore, introduction of economics by modern handling facilities on surface costs are not justified as full benefits will be realized only through reduced overhead where handling is an overhead factor.

### Costly Transportation

2. Broad Gauge Transportation.—This class of transportation, within and without, is most costly and should be avoided, if at all possible.

(a) Unloading Facilities for Raw Materials.—Here is one place where rehandling must be eliminated and Babylonian methods abandoned. There are handling facilities on the market for individual problems.

(b) Where broad-gauge transportation is essential, mixed cars should be avoided with material for north, east, west and south parts of the shop.

(c) Tractors should be used for shifting in the yards, and power winches for unloading positions, respotting empty and full cars to avoid idle-crew time and getting around Interstate Commerce full crews.

(d) Concrete should be used between broad gauge tracks to permit operation of tractors and trailers; particular attention should be paid to the area necessary for safe operation of tractors in bad weather.

With respect to broad gauge transportation, the time will be welcome when railroad companies will adopt standard cars to meet the handling problems. Possibly, a collapsible top for gondolas would be

## FINDING THE HIDDEN COSTS IN MATERIALS HANDLING

welcomed by those interested in steel, bar, sheet, pipe, and other materials. With the present box cars emptying costs are excessive.

3. Power Plant.—This should be looked over, as there are innumerable handling problems, and ones which can go to the handling market for cure.

4. Maintenance.—Here are involved many handling operations. The two most important ones are the "man" and "materials" movement. The man, or gang, should be given the right unit for conveying tools and materials to the job, preventing a pyramid of the "plumber's practice."

### To the Purchasing Department

5. Handling also reverts back to the purchasing department. Its attention should be called to correct sizes required; eliminating handling of oversized stock and avoiding losses in scrap. Correct sized stock permits direct placement from car to floor, at the point of manufacture. This applies to sheet, sections, bar and pipe stock.

6. Scheduling.—There is considerable to be said about planning and scheduling raw material to the first operation on the floor, and keeping it in "float." Hardware should be located on the floor in the line of flow, thereby eliminating rehandling.

7. Manufacturing Level.—This term implies that materials should be maintained at one level during the process of manufacture. It costs, as pointed out in a previous paragraph, much money to change levels, it increases man hours and investment in handling facilities. Modern machinery has played a great part in reducing the wear and tear on the human element, and correct methods of handling can do as much if given the same consideration and co-ordination of the shop forces. The operator should be kept at his position by moving materials to and from him by means of mechanical handling. The supervisor should have his set-up, so arranged that he does the walking and at a glance knows that the operator is kept in his position with work so scheduled that he has a visual measure of the day's production.

8. Red Tape.—Red tape, or paper handling, is another source which, if not analyzed, will eat up reductions made through other sources. This set-up should run parallel with the manufacturing set-up; in other words, the clerk who is unproductive labor and a part of overhead should work in close connection with the paper work, following the material, and having it automatically returned to him so that he is rightly informed of the progress of the order. Systematic material routing is systematic paper routing and reduces to a minimum the necessary evil of stock chasers.

9. Material Movement.—Movement through the manufacturing level should at all times be continuous. Skids should be used in connection with lift trucks, or tractors; conveyors; portable tote-pan trucks and racks. The skids should be designed with wheels so that they can be portable between immediate operations and still be handled by means of electric lift trucks, or tractors, for longer hauls. But, of all the handling methods and conveyances the simplest and most efficient method is termed "set-down" operation, or handling from operator to operator. Such set-ups have been accepted in preference to conveyors, under certain circumstances.

## COST AND MANAGEMENT

Even with conveyor installation, handling must be watched, as often excessive handling on and off the conveyor, from operation to operation, is not shown in the operation itself. In a particular case there were 45 operators on a small unit weighing 10 lb. As this unit was handled, off and on the belt each time, a close analysis revealed that a saving of 0.0003 hours per operation could be effected, or 0.0009 hours per unit by direct passing. With the activity of 5,000 units a day, the net savings were 45 hours, or the equivalent of 5% operators.

10. Inspectors should be kept moving!

11. Processing.—This should be kept in flow and be timed so that refinishing is not necessary, nor wrap-up for protection.

12. Set-ups should be watched not broken up. A production man may be "sandwiching in" his mistake; making rehandling necessary.

13. Handling must be tied-in so that the time-study department will have a clean-cut breakdown of handling operations. Intermediate handling operations should become a part of the operation line-up.

14. Our people are known as wasters both in industry and in their homes. They have been branded with the quotation that "their garbage cans would feed China." Handling of materials must be done with the utmost conservation of materials and labor in mind. Excess material on casting should be watched. It costs to handle extra poundage both as castings and turnings. Salvage of scrap should be watched and that department centralized, transportation and physical handling should be saved allowing for improved control and studied work-over of scrap. Handling of hardware should be watched and standard containers used from receipt to the point of application; eliminating physical handling in and out of binnage and in transportation. Processing should be watched. Centralizing will aid in obtaining manufacturing quantities to justify conveyORIZED set-ups, increase man output, machine loading and improve the product.

### Incentive Plan

15. The management of the Westinghouse Company has been most liberal in applying the incentive wage plan to activities, heretofore, not thought applicable, such as maintenance, plant transportation, storerooms, tool and die work, janitor service, and plant disposal of waste. Many of these activities, formerly considered indirect labor, are now considered direct labor and are written up as regular operations which are charged directly to the stock order. In the case of materials handling, the relation to productive labor is determined and the operation written up regularly. In costing, as has already been suggested, this item is regarded as direct labor and included in the cost of the product rather than in the overhead as an expense item.

Investment in handling equipment is an asset. Interest paid on unmoving stock is a liability. Decreased stock, under normal conditions, is the resultant of shorter manufacturing cycles, and the latter is a resultant of efficient handling methods, where 80 per cent manufacturing labor cost is the handling. There is no better way to cut costs than to simplify: (1) Designs, (2) tolerances, (3) tools, and (4) handling.

There is much consolation, along with the grief, in working in a large "diversified plant" as it still gets the dollars, in savings, wherein the highly specialized plants are hunting pennies, even mills.

## THE GROUP BONUS SYSTEM

# The Group Bonus System

(As in use by De Forest Radio Corporation, Ltd., Toronto.)

**T**HE first record of a group system is found in the report of the American Society of Mechanical Engineers in the year 1889. Henry Towne, of the firm of Yale and Towne, presented a paper outlining a system used in the Yale and Towne plants called "Gain Sharing." This was essentially a group bonus plan, under which all employees including foreman and executives received a share of the savings made by increased production and lowered expense.

However, credit is due to the great automobile companies for the development of modern bonus systems. Faced with the ever-mounting clerical cost of routine checking of individual piece work, similar operations on units were grouped together, and paid for when the unit was complete. This eliminated counting at each operation, and concentrated the thought and action of the group on the finished unit, instead of the individual pieces. Continual study and improvement by alert and progressive management and workers resulted in tremendous savings, and a reputation for efficiency, low costs and high wages known the world over. Such plants as Hudson, Packard and notably General Motors, as well as many accessory and parts plants are among those using this system. It has spread to practically every industry—over 50% (fifty per cent.) of the plants in America to-day use some form of incentive for their workers.

It will be seen that Group Bonus is not a new idea by any means, but a well proven system, used by some of the largest and most up-to-date plants in the country, to the satisfaction of both worker and management.

### Constitution of Group

In making a group it is usual to select a number of workers whose product is a finished unit, ready to turn into stock. This group may be only three or four workers, or may consist of a whole department, including truckers, machine setters, sweepers, etc. This can only be arrived at by careful study of the operations, equipment and logical flow of the work. Wherever possible every one who has a bearing on the output of the group is included and shares in the bonus earned.

### Base Rates

Each worker is guaranteed the payment of an hourly base rate for his time, regardless of his production. A new worker is started at the minimum rate for his classification, and skill. These base rates represent the going rate on the job whether it is on bonus or not, and are subject to change at any time. For instance, when an employee is transferred to another group carrying a different base rate, his rate may be changed to that of the new group. An employee can qualify for an increased base rate by exceptional skill, quality of output or other service to the company. Base rates are increased by the management on recommendation of the department foreman.

## COST AND MANAGEMENT

### Computation of Bonus

Bonus is figured as a percentage of the base rate earnings for the week.

#### *Example*

A works in Dept. 25 for forty-four hours.

Base rate = .50, Week's earnings .50x44 ..... \$22.00

20x\$22.00

Dept. Bonus = 20%, Week's Bonus =  $\frac{\quad}{100}$  ..... 4.40

Total pay ..... \$26.40

In exceptional cases bonus is figured on each day's pay separately and totaled for the week. The company reserves the right to change the time period of a group from daily to weekly, etc., to suit production conditions.

### Determination of Standards

Each operation in a group is carefully analyzed, then set up in the best known way and the average time needed for the operation noted. The total time for all the operations in a group is called the Net group time and includes all necessary movements in the making of the part, such as moving material, adjusting machines, etc. In some cases allowances are made for repairs, sweeping, defective material, etc. A number of studies are taken on each operation, on several operators wherever possible. Care is taken to select an operator of average skill. An allowance is added to the Net Time for personal needs, rest periods, etc. This total time then represents a reasonable period of time in which an average operator should complete the unit. This time is set in Hours per hundred pieces, and must be approved by the Foreman and Superintendent to be effective. This rate when once set and approved will not be changed unless the method, material or machine be changed. The Company, however, reserves the right to review all rates on July 1st and January 1st each year and make any change in rates which are obviously incorrect. A temporary price may be set on an operation which is not final or satisfactory and will be checked and approved when the operation is settled. A typical study is shown below:

Operation	R.F. Coil	Hrs. Per Hundred
Rivet .....		2.00
Wind .....		3.51
Strip .....		2.03
Solder .....		2.64
Test .....		1.40
Assemble .....		8.01
		19.59
Personal, etc. ....		3.50
		23.09
Approved .....	Foreman	
Approved .....	Superintendent	
Taken by.....	Date.....	

## THE GROUP BONUS SYSTEM

### Actual Time of Group

This is the total time spent by all operators in the group for the period. It is taken from the daily time sheets and checked from the clock card of each employee. Any time not spent on group work, such as maintenance, etc., is deducted from the actual hours.

### Determination of Bonus

If a group has to do only with the production of one particular piece, such as a condenser, or a complete chassis assembly, etc., its per cent. efficiency is found by multiplying the standard hours by the total number of finished pieces delivered to stock and dividing the result by the group's actual time.

#### *Example*

Production .....	200 pieces
Standard Hours .....	23.09
Actual Hours .....	48

$$\text{Efficiency} = \frac{200 \times 23.09}{48} = 96\%$$

On referring to the bonus table it is found that 96% efficiency pays 16% bonus. Therefore, all people in that group would earn a bonus of 16% on their base rate earnings for that period.

If two or more different parts are worked on by the same group, as in the Machine Shop, the finished quantity in each case is multiplied by its own group standard hours, and the sum of the results divided by the group actual time.

#### *Example*

Production—	Std.	Hrs.
2,000 stampings .....	2.1.....	42.00
5,000 screws .....	3.5.....	175.00
900 chassis .....	19.2.....	172.80
250 frames .....	8.6.....	21.50
Total Standard Hours.....		411.30
Total Actual Hours.....		373.90

$$\text{Efficiency} = \frac{411.30}{373.90} = 110\%$$

On looking this up in Bonus table it is found that 110% efficiency pay 30% bonus. Therefore all employees in this group would earn a bonus of 30% of their base rate earnings for that period.

## COST AND MANAGEMENT

### Bonus Table

Per cent. Efficiency	Per cent. Bonus	Per cent. Efficiency	Per cent. Bonus
73—75 .....	1 %	91 .....	11 %
76—78 .....	2 %	92 .....	12 %
78—80 .....	3 %	93 .....	13 %
81—82 .....	4 %	94 .....	14 %
83—84 .....	5 %	95 .....	15 %
85—86 .....	6 %	96 .....	16 %
87 .....	7 %	97 .....	17 %
88 .....	8 %	98 .....	18 %
89 .....	9 %	99 .....	19 %
90 .....	10 %	100 .....	20 %

And one per cent. for each point above 100 %

110 % Efficiency = 30 % Bonus

120 % Efficiency = 40 % Bonus

### New Employees

Inexperienced employees are hired at minimum rate and placed in a group to learn the operations for a fixed period. This period varies from a day to a week depending on the operation. During this period the group receive the benefit of the production of the new worker, but his time is not included in the actual time of the group. If the new member of the group is experienced no allowance is made. At the end of the earning period the group must carry the new worker. New employees should be helped as much as possible—it all helps your bonus.

### Defective Work

Defective work is not paid for. Work which is found to be faulty after leaving the Department is sent to the Salvage Department for repair. The cost of making this repair is charged against the group making the faulty part by adding three times the time of repair to the actual hours of the group. That is if it took one hour to make the repair, three hours will be added to the actual hours of the group responsible. This represents the approximate cost of doing the repair, due to overhead, equipment, etc., and is not intended as a penalty. It is definitely to your advantage to turn out work in 100 % condition. If a worker spoils material, his time and that already spent on the part is lost, and must be carried by the rest of the group. It is to everybody's advantage to be on watch for defective work. Salvage work on a discontinued job will be charged back to the group that caused it even though the group is working on a new job. Remember repairs cost you money and cost your Company money.

### Work In Process

Unfinished work is not making money for you. Don't let the work pile up here and there—everybody must keep busy and help out wherever they can. Don't keep shirkers in your group—they drag down your bonus fast. Remember that only work finished and delivered to stock earns bonus for you. If you are waiting for stock or for a machine to be set, see your foreman or help the other fellow. It all helps your bonus. Be regular and be punctual—an absentee holds up the line and the group.

## THE GROUP BONUS SYSTEM

### Conclusion

It is the wish of the management to see every group earning from 20% bonus upwards. There is no limit placed on the amount of bonus which may be earned.

By helping one another, by studying your job and mastering it thoroughly, by keeping your position and your Department in 100% condition, by being punctual and regular—these will help you toward a bigger pay envelope and a better job.

HE PROFITS MOST WHO SERVES BEST.

## COURSE IN COST ACCOUNTING IN TORONTO

THE University of Toronto, Department of University Extension, has this year added to its list a course in cost accounting. The fee for the course is \$5, and the course will be given only if 30 or more students enroll. It will consist of twenty lectures on Thursday evenings, at 8 p.m., in University College Building.

The programme of the University of Toronto Extension Department includes the following series of lectures, which may be of interest to our members:

Subject	Evening	Beginning
Accounting, Junior .....	Monday .....	October 13
Accounting, Advanced .....	Tuesday .....	" 14
Cost Accounting .....	Thursday .....	" 16
Business Organization .....	Wednesday .....	" 15
Economics, Elementary .....	Wednesday .....	" 15
Economics, Advanced .....	Wednesday .....	" 15
Mercantile Law .....	Friday .....	" 17
Secretarial Practice .....	Thursday .....	" 16

The fee for each of the above courses is \$5. A course will be given only when 30 or more students enroll. Each course will consist of about 20 lectures in University College building. Each lecture will consist of a talk of about one hour by the instructor, followed by a period of discussion.

Our Society's office at 81 Victoria Street, Toronto, has further particulars and a supply of enrollment forms, or they may be secured from the University Extension Dept., Room 222, Simcoe Hall, University of Toronto, or telephone Trinity 5001.

## CALGARY ACCOUNTANTS EXPRESS INTEREST IN SOCIETY'S WORK

While in Calgary on September 15th, W. A. McKague, general secretary of the Canadian Society of Cost Accountants & Industrial Engineers, met the Chartered Accountants' Club of that city, and briefly outlined the scope and operations of the Society. Members of the club expressed their interest, and promised support if the Society should at any time wish to arrange for a Chapter in Calgary.

## THE TREND OF PRODUCTION COSTS

**R**EDUCTIONS in commodity prices continue prominent, and are steadily bringing down production costs in most lines of business. Statistics for August show that no less than ten commodities or groups of commodities dropped by three per cent. or over in price, while in only one case was there an advance of that amount. Competition is of course also bringing cuts in prices of manufactured goods or services, but in a time like this the tendency is for raw materials to go down more quickly than finished goods. This is demonstrated by the fact that the index for all commodities in August was 84.1, against 98.4 one year previous, the year's decline being therefore 14.3 per cent. of the 1926 price level, which is the base period for the calculation. Consumers' goods, however, are down only from 96.3 to 86.5, or by 9.8 per cent., while producers' materials are down from 100.8 to 78.7, or by 22.1 per cent. "Consumers' goods" in this case are taken at wholesale prices. A separate index of retail prices shows a decrease from 101.0 to 98.9, or only 2.1 per cent.

This makes it clear that the savings which should result from lower price levels have not yet worked through to the consumer to any great degree, part being withheld in the manufacturing stage and wholesale stages and part in the retail field. Nor does this by any means indicate abnormal manufacturing profit in manufacturing or distributing. In most cases the increased costs due to lowered volume more than offsets savings in raw material being purchased. In the ordinary course of events, savings will be passed along to consumers later on as volume recovers, even though prices of raw materials have then tightened up or even advanced.

The following are index numbers of prices compiled by the Dominion Bureau of Statistics, covering 502 commodities, with 1926 prices taken as 100:

	August 1929	July 1930	August 1930
Foods, beverages and tobacco .....	103.7	91.3	88.1
Other consumers' goods .....	91.3	85.9	85.4
All consumers' goods .....	96.3	88.1	86.5
Building and construction materials .....	99.2	89.7	88.0
Manufacturers' materials .....	101.2	78.5	76.7
All producers' materials .....	100.8	80.5	78.7
All producers' equipment .....	94.9	91.3	91.3
All producers' goods .....	100.2	81.7	80.0
All commodities .....	98.4	85.8	84.1

The groups to show important decreases in August were: Bakery products, vegetables, fishery products, live stock, meats and poultry, raw cotton, raw wool, wool cloth, lumber and timber, brass, copper and its products. One group to show an advance of importance was eggs.

## CHAPTER NOTES

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## WINNIPEG

T. E. Saul, C.A., Secretary-Treasurer.

The first meeting of Winnipeg Chapter this season was held in the Marlborough Hotel on September 22, with John Parton, C.A., in the chair. H. Latter, of the Vulcan Iron Works, Ltd., spoke on Inventory Control. The officers had arranged for G. R. Beedie, Zone Parts and Service Manager of General Motors of Canada, Ltd., to speak on this subject at the meeting, but he had unfortunately been compelled to cancel his engagement. Mr. Latter explained that his address had therefore been prepared somewhat hurriedly, but after some revision it will be available for publication, and at the meeting it brought forth a lively discussion.

W. W. McVey, C.A., reported on program arrangements, stating that these were now practically complete, and that the Chapter can look forward to a series of interesting meetings this year.

W. A. McKague, general secretary of the Society, was present, and spoke briefly on the progress of the Society and its work. He referred particularly to the establishment of the new Chapter in Vancouver, and stated that the increased interest in costing in the manufacturing centres of the West was very encouraging, and that the expansion of the Society should make possible more personal contact among the members throughout the country. Mr. McKague also referred to demands for systematic training for cost men, and to plans which the Society had in mind to meet this need.

## NEW MEMBERS

The following are new members of the Society:

### Montreal Chapter

Chabot, F. A., Dept. of National Revenue, Montreal.  
Desrochers, J. A., C.A., Frontenac Breweries, Ltd., Montreal.  
Grimard, A. A., C.A., 45 St. James St., Montreal.

### Toronto Chapter

\*Brown, W. J., Gurney Foundry Co., Ltd., Toronto.  
\*Doelman, M. L., Gurney Foundry Co., Ltd., Toronto.  
McLachlan, W. R., De Forest Radio Corporation, Ltd., Toronto.  
\*Prosser, R. B., Thos. Meadows & Son, Ltd., Toronto.  
Wallace, G. R., Business Systems Ltd., Toronto.  
Wilkinson, R., C.A., The Robert Simpson Co., Ltd., Toronto.

### Hamilton Chapter

\*Doering, R. C., Frost Steel & Wire Co., Ltd., Hamilton.  
\*McDonald, A. L., Tallman Brass & Metal Co., Ltd., Hamilton.  
\*Reynolds, P., Tallman Brass & Metal Co., Ltd., Hamilton.

## COST AND MANAGEMENT

### Vancouver Chapter

Brownlow, F., Vulcan Engineering Works, Ltd., Vancouver.  
Campbell, H. D., C.A., 808-812 Standard Bank Bldg., Vancouver.  
Corley, T. J., City Hall, Vancouver.  
Cox, H. V., Canadian Westinghouse Co., Ltd., Vancouver.  
Dull, J. S., Gregory Tire & Rubber Co., Ltd., Port Coquitlam.  
Griffiths, Wm., C.A., New Westminster.  
\*Haig, R. F., Remington Typewriters, Ltd., Vancouver.  
Harvey, J., C.A., Peat, Marwick, Mitchell & Co., Vancouver.  
Kirkby, R. V., Fraser Valley Milk Producers' Association, Vancouver.  
Plommer, J. J., C.A., Shaw, Salter & Plommer, Vancouver.  
Poole, P. E., Swift Canadian Co., Ltd., Vancouver.  
Robertson, R. T., Remington Typewriters, Ltd., Vancouver.

\*Junior membership.

## COST LITERATURE

### RECEIVED IN SEPTEMBER

**S**OME Cost Accounting Terms. John Whitmore. The Journal of Accountancy, September, 1930.

Road Transport Costs. K. G. Fenelon. The Accountants' Magazine, August, 1930.

International Conference on Budgetary Control. The Cost Accountant, August, 1930.

Reducing Office Costs. Frank P. Hamon. Canadian Office, September, 1930.

Retail Store Cost Methods. Samuel Einstein. N.A.C.A. Bulletin, August 15, 1930.

Airplane Engine Costs. A. W. Hutchinson. N.A.C.A. Bulletin, August 5, 1930.

Some Points in Burden Distribution. Albert E. Grover. N.A.C.A. Bulletin, September 1, 1930.

Interest on Investment is an Element of Cost. Wm. R. Donaldson. N.A.C.A. Bulletin, September 1, 1930.

Executive and Key Men Bonuses. A. W. Bass. N.A.C.A. Bulletin, September 15, 1930.

The Use of Sales Incentives to Control Sales and Profits. Merton L. Emerson. N.A.C.A. Bulletin, September 15, 1930.

A Control Cost System for the Rolled Gold Plate Industry. J. C. J. Stone. N.A.C.A. Bulletin, September 15, 1930.

Measuring Office Machine Output as a Basis for Wage Incentives. John Mitchell. S.I.E. Bulletin, September, 1930.

The Comfort Zone in Industry. Perry A. Fellows. S.I.E. Bulletin, September, 1930.

